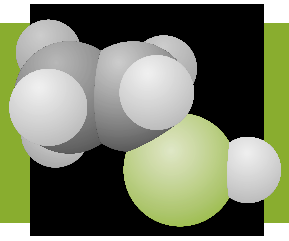
Technology Success Story

CHEMICALS



Recycling of Thermoplastics via Froth Flotation

Benefits

- Energy savings of more than 97 trillion Btu per year by 2020
- Reduced waste production by more than 800,000 tons per year by 2020
- Decreased greenhouse gas emissions of 139 pounds of CO_2 per pound of recycled plastic
- Feedstock cost savings of 60 to 80 percent using recycled plastics
- Recovery of 300 million pounds of valuable plastics

New Process to Recover Valuable Plastics from Mixed Plastic Waste Streams

Plastic waste streams from post-consumer items such as appliances and automobiles often contain high-value plastics. Efforts to recover and reuse these plastics have been stymied by the lack of an economical technique for separating plastics with identical or similar densities. Growing use of mixed plastics in manufactured products has heightened the need to recover and recycle these valuable materials and avoid sending them to landfills.

Researchers at Argonne National Laboratory have developed a new technique, called froth flotation, that cost-effectively separates thermoplastics without using hazardous chemicals. The technology has successfully been used to recover selected plastics from obsolete appliances, auto shredder residue, disassembled car parts, industrial scrap plastics, and consumer electronics.

Froth Flotation

Researchers at Argonne have used the patented flotation process to recover thermoplastics from appliance scrap and injection mold the materials into headlamp "back-cans."

Solution

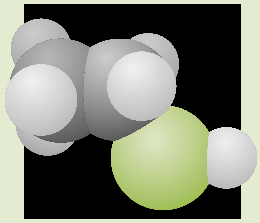
Froth flotation is a new technology that can effectively separate two or more types of plastic that have similar or identical densities. It is applied as a finishing step to conventional separation methods already used for plastics of different densities. The froth flotation process uses the surface wetting characteristics of the plastic materials as the basis for separation. The plastics are immersed in a chemical solution that alters the surface-wetting characteristics of the different plastics. Small gas bubbles are attached to the surface of one plastic, causing it to float, while the other plastic sinks.

The two types of plastics that have been tested most extensively are ABS (acrylonitrile-butadiene-styrene) and HIPS (high-impact polystyrene), which are widely used in appliances, automobiles, and electronics. Recycling of ABS and HIPS could prevent the landfilling of 570 million pounds of automobile and appliance scrap produced annually. Argonne is also working on projects to apply froth flotation to the recovery of plastics from computer housing scrap and nylon manufacturing waste.

The plastics produced from froth flotation are of mid-grade commercial quality and are priced competitively with virgin materials. Once the technology becomes commercially available, recovered ABS and HIPS will cost manufacturers about 50 percent less than virgin materials. The recovered polymers can be used for such products as computers, office equipment, automotive parts, telephones, and home appliances.

Results

With funding from the Department of Energy's Office of Industrial Technologies, Argonne National Laboratory has finished pilot testing of froth flotation, and licensing negotiations are now underway. Some of the most promising uses for the recovered thermoplastics are in automotive parts. Researchers at Argonne have used the recycled ABS from an appliance to mold headlamp "back-cans." This is the first successful application using 100-percent recycled materials in an automotive application. Automotive heating, ventilation, and air conditioning (HVAC) duct parts have also been injection molded. Lear Corporation, Ford, and Volvo have all conducted molding tests with the recovered plastics. In 2000, froth flotation was a *Discover Magazine* Award finalist.



Project Partners:

American Recycling Partnership
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Appliance Recycling Centers of America, Inc.
Minneapolis, MN

Argonne National Laboratory
Argonne, IL

Vehicle Recycling Partnership
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